

Application No.: 10/670,145

Docket No.: TKHR6110-D1

**REMARKS****Present Status of the Application**

The Office Action rejected all presently-pending claims 17-32, 72, 73 and 75. Specifically, the Office Action rejected claims 30-31 under 35 U.S.C. 112, second paragraph. The Office Action rejected claims 17-20, 22, 24-25, 28, 72, 73, 75 under 35 U.S.C. 102(e) as being anticipated over Bathra (U.S. 6,387,797). The Office Action rejected claims 21, 23, 29, 32 under 35 U.S.C. 103(a) as being unpatentable over Bothra in view of Bandyopadhyay (U.S. 5,814,555). The Office Action also rejected claim 26 under 35 U.S.C. 103(a) as being unpatentable over Bothra in view of Ngo (U.S. 6,190,966). The Office Action rejected claim 27 under 35 U.S.C. 103(a) as being unpatentable over Bothra in view of Ackermann (U.S. 5,062,508).

Applicants have cancelled claims 30-31 and amended claims 17, 72 and 75 to overcome the rejections. After entry of the foregoing amendments, claims 17-29, 32, 72, 73 and 75 remain pending in the present application, and reconsideration of those claims is respectfully requested.

**Discussion of Office Action Rejections**

The limitation "a top surface of the substrate not covered by the conductive structures is lower than an interface between the substrate and the conductive structure" added into claims 17, 72, 75 is described in pages 9-10 and shown in Figs. 4A~4B.

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*Applicants respectfully traverse the 102(e) rejection of claims 17-20, 22, 24-25, 28, 72, 73, 75 because Bathra (U.S. 6,387,797) does not teach every element recited in these claims.*

In order to properly anticipate Applicants' claimed invention under 35 U.S.C 102, each and every element of claim in issue must be found, "either expressly or inherently described, in a single prior art reference". "The identical invention must be shown in as complete details as is contained in the .... claim. Richardson v. Suzuki Motor Co., 868 F. 2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989)." See M.P.E.P. 2131, 8<sup>th</sup> ed., 2001.

The present invention is in general related a semiconductor interconnect structure as claims 17, 72 and 75 recite:

Claim 17. (currently amended) A semiconductor interconnect structure, comprising:  
a substrate;

a conductive structure over the substrate, wherein the conductive structure has a top surface and a side surface;

a first dielectric layer over the conductive structure and the substrate, having first level air gaps therein, wherein the side surface of the conductive structure is surrounded by the first level air gaps and an upper portion of the side surface is surrounded by the first dielectric layer, wherein ***a top surface of the substrate not covered by the conductive structure is lower than an interface between the substrate and the conductive structure;***

an etching stop layer over the first dielectric layer, wherein the etching stop layer is disposed over the first level air gaps; and

an opening disposed over the top surface and part of the upper portion of the side surface of the conductive structure, wherein the first level air gaps are isolated from the opening by the etching stop layer.

Claim 72. (currently amended) A semiconductor interconnect structure, comprising:  
a substrate;

a pair of conductive structures over the substrate, wherein an air gap disposed between the conductive structures; and

a dielectric layer over the conductive structures, the dielectric layer having a stop layer disposed over the air gap, and ***a top surface of the substrate not covered by the conductive structures is lower than an interface between the substrate and the conductive structures,*** wherein the dielectric layer has an opening disposed over at least a portion of the conductive structure and at least a top portion of the stop layer, the opening being isolated from the air gap.

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Claim 75. (currently amended) A semiconductor interconnect structure, comprising:

a substrate;

a pair of conductive structures over the substrate, wherein an air gap disposed between the conductive structures;

a dielectric layer over the substrate, having an air gap formed within, the air gap disposed between the conductive structures, and *a top surface of the substrate not covered by the conductive structures is lower than an interface between the substrate and the conductive structures;*

a stop layer disposed over the air gap; and

an opening disposed over at least part of the stop layer and at least part of the conductive layer, wherein the air gap is isolated from the opening.

Bothra discloses a structure comprising a substrate 202, a dielectric layer 204, conductive structures 206, 208, a dielectric layer 210 having air gaps 216 therein, an etching stop material 220 on the dielectric layer 210 above the air gaps 216, a dielectric layer 222 over the dielectric layer 210 and the etching stop material 220, and openings 224, 226 in the dielectric layers 222, 210 to expose the conductive structures 206, 208. Bothra merely discloses the conductive structures are formed on the dielectric layer 204. Bothra does not teach or suggest that "a top surface of the substrate not covered by the conductive structures is lower than an interface between the substrate and the conductive structure". As shown in Fig. 4A of the present invention, a distance of "d" is existed between the top surface of the substrate not covered by the conductive structures and the interface between the substrate and the conductive structure. Therefore, Bothra does not teach every element recited in claims 17, 72 and 75.

For at least the foregoing reasons, Applicant respectfully submits that independent claims 17, 72 and 75 patently define over the prior art references, and should be allowed. For at least

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the same reasons, dependent claims 18-20, 22, 24-25, 28, 73 patently define over the prior art as well.

*Applicants respectfully traverse the rejection of claims 21, 23, 29, 32 under 103(a) as being unpatentable over Bothra in view of Bandyopadhyay (U.S. 5,814,555), the rejection of claim 26 under 103(a) as being unpatentable over Bothra in view of Ngo (U.S. 6,190,966) and the rejection of claim 27 under 35 U.S.C. 103(a) as being unpatentable over Bothra in view of Ackermann (U.S. 5,062,508) because a prima facie case of obviousness has not been established by the Office Action.*

To establish a prima facie case of obviousness under 35 U.S.C. 103(a), each of three requirements must be met. First, the reference or references, taken alone or combined, must teach or suggest each and every element in the claims. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references in a manner resulting in the claimed invention. Third, a reasonable expectation of success must exist. Moreover, each of the three requirements must "be found in the prior art, and not be based on applicant's disclosure." See M.P.E.P. 2143, 8<sup>th</sup> ed., February 2003.

Applicants first submit that, as disclosed above, Bothra fails to teach or suggest each and every element of claims 17, 72, 75 from which claims 21, 23, 26-27, 29, 32 depend. Bandyopadhyay, Ngo and Ackermann cannot cure the deficiencies of Bothra. Therefore, independent claims 17, 72 and 75 are patentable over Bothra, Bandyopadhyay, Ngo and

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Ackermann. For at the least the same reasons, their dependent claims 21, 23, 26-27, 29, 32 are also be patentable.

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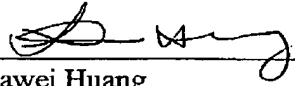
**CONCLUSION**

For at least the foregoing reasons, it is believed that the pending claims 17-29, 32, 72, 73 and 75 are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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